EXAM PAPERS PRACTICE

Using a Calculator

Model Answers

Question 1

2 (a) Calculate $\sqrt{5.7} - 1.03^2$.

Write down all the numbers displayed on your calculator. [1]

Answer

1. Calculate the square root of 5.7:
$\sqrt{5.7} \approx 2.387$
2. Calculate 1.03^2;
$1.03^2 = 1.0609$
3. Subtract the result of 1.03^2 from the square root of 5.7:
$2.387 - 1.0609 \approx 1.3261$
Therefore, $\sqrt{5.7} - 1.03^2$ is approximately equal to 1.3261 .

(b) Write your answer to **part (a)** correct to 3 decimal places. [1]

Answer

$\sqrt{5.7} - 1.03^2 \approx 1.326$
So, $\sqrt{5.7} - 1.03^2$ is approximately equal to 1.326 when rounded to three decimal places.

Question 2

1 Use your calculator to work out $\sqrt{\frac{3}{4}} + 2^{-1}$. Give your answer correct to 2 decimal places.

Answer

1. Calculate the square root of $\frac{3}{4}$:
$\sqrt{\frac{3}{4}} = \frac{\sqrt{3}}{\sqrt{4}} = \frac{\sqrt{3}}{2}$
2. Calculate 2^{-1}, which is the same as taking the reciprocal of 2 :
$2^{-1} = \frac{1}{2}$
3. Add the two results:
$\frac{\sqrt{3}}{2} + \frac{1}{2}$
Now, combine the fractions by finding a common denominator:
$\frac{\sqrt{3}+1}{2}$
Rounded to two decimal places:
$\frac{\sqrt{3}+1}{2} \approx 1.37$
So, $\sqrt{\frac{3}{4}} + 2^{-1}$ is approximately equal to 1.37 when rounded to two decimal places.

[2]

Question 3

Calculate $\sqrt{120} + 3.8^2 - 25$. [1]

Answer

1. Calculate the square root of 120 :
$\sqrt{120} \approx 10.95$
2. Calculate 3.8^2 :
$3.8^2 = 14.44$
3. Subtract 25:
$10.95 + 14.44 - 25 \approx 0.39$
So, $\sqrt{120} + 3.8^2 - 25$ is approximately equal to 0.39 .

Question 4

Calculate $\sqrt{\frac{1}{2}(1-\cos 48°)}$.

Answer [1]

1. Evaluate $\cos 48°$:
$\cos 48° \approx 0.6691$
2. Substitute the value back into the expression:
$\sqrt{\frac{1}{2}(1-0.6691)}$
3. Perform the calculations:
$\sqrt{\frac{1}{2} \times 0.3309}$
4. Calculate the square root:
$\sqrt{0.16545} \approx 0.406$
So, $\sqrt{\frac{1}{2}(1-\cos 48°)}$ is approximately equal to 0.406 .

Question 5

Calculate.

(a) $2^3-\sqrt{10+4^2}$ [1]

1. Calculate 2^3 :
$2^3 = 8$
2. Calculate 4^2 :
$4^2 = 16$
3. Add 10 to the result of 4^2 :
$10 + 16 = 26$
4. Take the square root of the sum:
$\sqrt{26}$
Now, substitute these values back into the original expression:
$8 - \sqrt{26}$
So, $2^3 - \sqrt{10+4^2}$ is equal to $8 - \sqrt{26}$. If you need a numerical approximation, you can use a calculator to find the square root:
$8 - \sqrt{26} \approx 1.358$
Therefore, $2^3 - \sqrt{10+4^2}$ is approximately equal to 1.358 .

(b) $\dfrac{2\sqrt{3}\times\tan 70°}{3}$ [1]

1. Evaluate $\tan 70°$:
- If you're working in degrees, $\tan 70°$ is a numerical value. You can use a calculator to find that $\tan 70° \approx 2.747$.
2. Multiply by $2\sqrt{3}$;
$2\sqrt{3} \times 2.747$
3. Divide by 3:
$\frac{2\sqrt{3}\times 2.747}{3}$
Now, perform the calculations:
$\frac{2\sqrt{3}\times 2.747}{3} \approx \frac{5.494\sqrt{3}}{3}$
So, $\frac{2\sqrt{3}\times\tan 70°}{3}$ is approximately equal to $\frac{5.494\sqrt{3}}{3}$. If you need a numerical approximation, you can further evaluate this expression.

Question 6

Find the cube root of 4913. [1]

The cube root of a number is a value that, when multiplied by itself twice, gives the original number. In this case, to find the cube root of 4913 :
$\sqrt[3]{4913}$
One way to find this is to look for a number whose cube is 4913 . It turns out that $17^3 = 4913$. Therefore, the cube root of 4913 is 17.
So, $\sqrt[3]{4913} = 17$

Question 7

The thickness of one sheet of paper is 8×10^{-3} cm. Work out the thickness of 250 sheets of paper.

Answer

To find the total thickness of 250 sheets of paper, you can simply multiply the thickness of one sheet by the number of sheets:

Total thickness = Thickness of one sheet × Number of sheets

Given that the thickness of one sheet is 8×10^3 cm and the number of sheets is 250 :

Total thickness $= (8 \times 10^3 \text{ cm}) \times (250)$

Now, perform the multiplication:

Total thickness $= 2 \times 10^6$ cm

So, the thickness of 250 sheets of paper is 2×10^6 cm.

[1]

Question 8

(a) Use your calculator to find the value of $7.5^{-0.4} \div \sqrt{57}$.
Write down your full calculator display. [1]

Answer

Let's verify if the equation $7 \cdot 5^{-0.4} = \sqrt{57}$ is true.

1. Evaluate $5^{-0.4}$

$5^{-0.4} = \frac{1}{5^{0.4}}$

Since $5^{0.4}$ is the same as the square root of 5 raised to the power of 0.4 , let's find the square root of 5 first:

$\sqrt{5} \approx 2.236$

Now, calculate $5^{-0.4}$:

$\frac{1}{5^{0.4}} \approx \frac{1}{2.236} \approx 0.447$

2. Multiply by 7:

$7 \cdot 0.447 \approx 3.129$

3. Check if it's equal to $\sqrt{57}$:

$\sqrt{57} \approx 7.55$

The values are not equal. Therefore, the given equation $7 \cdot 5^{-0.4} = \sqrt{57}$ is not true. Please double-check the expression or clarify if there's any mistake in the provided equation.

(b) Write your answer to **part (a)** in standard form. [1]

Answer

$7 \cdot 5^{-0.4} \approx 3.129$

In standard form, a number is usually expressed as $a \times 10^n$, where $1 \leq a < 10$ and n is an integer. To express 3.129 in standard form, we can write it as:

$3.129 = 3.129 \times 10^0$

So, the result in standard form is approximately 3.129×10^0.

Question 9

(a) Use a calculator to work out $\frac{5^{0.4}-\sqrt{3}}{0.13-0.015}$. Write down all the digits in your calculator display.

[1]

1. Evaluate $5^{0.4}$

$5^{0.4}=\sqrt[5]{5^2}=\sqrt[5]{25}\approx 2.236$

2. Evaluate $\sqrt{3}$:

$\sqrt{3}\approx 1.732$

3. Evaluate the denominator $0.13-0.015$:

$0.13-0.015=0.115$

Now substitute these values back into the expression:

$\frac{5^{0.4}-\sqrt{3}}{0.13-0.015}=\frac{2.236-1.732}{0.115}$

Perform the calculations:

$\frac{0.504}{0.115}\approx 4.383$

So, $\frac{5^{0.4}-\sqrt{3}}{0.13-0.015}$ is approximately equal to 4.383 .

[1]

(b) Write your answer to **part (a)** correct to 2 significant figures.

To express the result in two significant figures, we need to round the value to the appropriate precision. In this case:

4.383

Rounded to two significant figures, this becomes:

4.4

So, the expression $\frac{5^{0.4}-\sqrt{3}}{0.13-0.015}$ is approximately equal to 4.4 when rounded to two significant figures.

Question 10

Use a calculator to find

(a) $\sqrt{5\frac{5}{24}}$, [1]

1. Convert the mixed number to an improper fraction:

$5\frac{5}{24}=\frac{5\times 24+5}{24}=\frac{120+5}{24}=\frac{125}{24}$

2. Take the square root of the fraction:

$\sqrt{\frac{125}{24}}$

3. Factorize the fraction and simplify if possible:

$\sqrt{\frac{5\times5\times5}{2\times2\times2\times3}}$

The square root of $5\times5\times5$ is $5\sqrt{5}$, and the square root of $2\times2\times2\times3$ is $2\sqrt{3}$. So, $\sqrt{\frac{125}{24}}$ is equivalent to $\frac{5\sqrt{5}}{2\sqrt{3}}$.

Therefore, $\sqrt{5\frac{5}{24}}=\frac{5\sqrt{5}}{2\sqrt{3}}$.

(b) $\frac{\cos 40°}{7}$. [1]

To simplify the expression $\frac{\cos 4U°}{7}$, you can use a calculator to find the numerical value of $\cos 40°$ and then perform the division.

1. Evaluate $\cos 40°$;

$\cos 40°\approx 0.766$

2. Divide by 7:

$\frac{0.766}{7}\approx 0.109$

Therefore, $\frac{\cos 40°}{7}$ is approximately equal to 0.109 .

Question 11

$m = \frac{1}{4}[3h^2 + 8ah + 3a^2]$ Calculate the exact value of m when $h = 20$ and $a = -5$.

Answer

To calculate the exact value of m when $h = 20$ and $a = -5$ in the given expression

$m = \frac{1}{4}(3h^2 + 8ah + 3a^2)$

Substitute the values $h = 20$ and $a = -5$ into the expression:

$m = \frac{1}{4}(3(20)^2 + 8(-5)(20) + 3(-5)^2)$

Now, perform the calculations:

$m = \frac{1}{4}(3(400) - 800 + 75)$

$m = \frac{1}{4}(1200 - 800 + 75)$

$m = \frac{1}{4}(475)$

$m = \frac{475}{4}$

So, the exact value of m when $h = 20$ and $a = -5$ is $\frac{475}{4}$.

Question 12

Calculate $3\sin 120° - 4(\sin 120°)^3$. [2]

Answer

1. Evaluate $\sin 120°$:

$\sin 120° = \sin(180° - 60°) = \sin 60° = \frac{\sqrt{3}}{2}$

2. Substitute the value into the expression:

$3\left(\frac{\sqrt{3}}{2}\right) - 4\left(\frac{\sqrt{3}}{2}\right)^3$

3. Perform the calculations:

$3 \times \frac{\sqrt{3}}{2} - 4 \times \frac{(\sqrt{3})^3}{2^3}$

$\frac{3\sqrt{3}}{2} - \frac{4\sqrt{3}}{8}$

Simplify the fraction:

$\frac{3\sqrt{3}}{2} - \frac{\sqrt{3}}{2}$

Combine like terms:

$\frac{2\sqrt{3}}{2}$

$\sqrt{3}$

So, $3\sin 120° - 4(\sin 120°)^3 = \sqrt{3}$.

Question 13

Calculate $81^{0.25} \div 4^{-2}$. [2]

1. Evaluate $81^{0.25}$;
$81^{0.25} = \sqrt[4]{81} = 3$
2. Evaluate 4^{-2} :
$4^{-2} = \frac{1}{4^2} = \frac{1}{16}$
3. Perform the division:
$\frac{3}{\frac{1}{16}}$
To divide by a fraction, multiply by its reciprocal:
3×16
48
So, $81^{0.25} \div 4^{-2} = 48$.

Question 14

6 Use your calculator to find the value of $2^{\sqrt{3}}$.

Give your answer correct to 4 significant figures. [2]

Calculating $2^{\sqrt{3}}$ involves raising 2 to the power of the square root of 3 . The numerical value of $\sqrt{3}$ is approximately 1.732 .
$2^{\sqrt{3}} \approx 2^{1.732}$
Now, calculate the value:
$2^{1.732} \approx 2.665$
So, $2^{\sqrt{3}}$ is approximately equal to 2.665 when rounded to four significant figures.

Question 15

Use a calculator to work out the **exact** value of $1 + \frac{1}{5} + \left(\frac{1}{5}\right)^2 + \left(\frac{1}{5}\right)^3 + \left(\frac{1}{5}\right)^4$.

The given expression represents a geometric series. The formula for the sum of a geometric series is:
$S_n = \frac{a(1-r^n)}{1-r}$
where:
- a is the first term,
- r is the common ratio,
- n is the number of terms. [2]

In this case, the first term (a) is 1 , the common ratio (r) is $\frac{1}{5}$, and there are 5 terms $(n = 5)$. Now, plug these values into the formula:
$S_5 = \frac{1\left(1-\left(\frac{1}{5}\right)^5\right)}{1-\frac{1}{5}}$
Now, calculate the expression:
$S_5 = \frac{1\left(1-\frac{1}{3125}\right)}{\frac{4}{5}}$
$S_5 = \frac{1 \times \frac{3124}{3125}}{\frac{4}{5}}$
$S_5 = \frac{\frac{3124}{3125}}{\frac{4}{5}}$
$S_5 = \frac{3124}{3125} \times \frac{5}{4}$
$S_5 = \frac{781}{625}$
So, the exact value of the given series is $\frac{781}{625}$.

Question 16

Calculate $\sqrt[3]{2.35^2 - 1.09^2}$.
Give your answer correct to 4 decimal places.

[2]

1. Calculate 2.35^2 :

$2.35^2 = 5.5225$

2. Calculate 1.09^2 :

$1.09^2 = 1.1881$

3. Subtract 1.09^2 from 2.35^2 :

$5.5225 - 1.1881 = 4.3344$

4. Take the cube root of the result;

$\sqrt[3]{4.3344} \approx 1.6904$

Rounded to four decimal places, $\sqrt[3]{2.35^2 - 1.09^2}$ is approximately equal to 1.6904 .

Question 17

Calculate the value of $\frac{1}{2}\sqrt{\frac{1}{2}+\frac{1}{2}\sqrt{\frac{1}{2}}}$

(a) writing down all the figures in your calculator answer,

(b) writing your answer correct to 4 significant figures.

Answer

$\frac{1}{2}\sqrt{\frac{1}{2}+\frac{1}{2}\sqrt{\frac{1}{2}}} = \frac{\sqrt{2}+1}{4}$

Now, rounding to four significant figures:

$\frac{\sqrt{2}+1}{4} \approx 0.8536$

So, $\frac{1}{2}\sqrt{\frac{1}{2}+\frac{1}{2}\sqrt{\frac{1}{2}}}$ is approximately equal to 0.8536 when rounded to four significant figures.

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1. Evaluate the innermost square root:

$\sqrt{\frac{1}{2}} = \frac{1}{\sqrt{2}}$

2. Substitute this value back into the expression:

$\frac{1}{2}\sqrt{\frac{1}{2}+\frac{1}{2}\cdot\frac{1}{\sqrt{2}}}$

3. Simplify the expression inside the square root:

$\frac{1}{2}\sqrt{\frac{1}{2}+\frac{1}{2\sqrt{2}}}$

4. Combine the fractions inside the square root:

$\frac{1}{2}\sqrt{\frac{\sqrt{2}+1}{2\sqrt{2}}}$

5. Multiply the numerator and denominator by $\sqrt{2}$ to rationalize the denominator:

$\frac{1}{2}\sqrt{\frac{(\sqrt{2}+1)\sqrt{2}}{4}}$

6. Simplify:

$\frac{1}{2}\sqrt{\frac{\sqrt{2}(\sqrt{2}+1)}{4}}$

$\frac{1}{2}\sqrt{\frac{2+\sqrt{2}}{4}}$

$\frac{1}{2}\sqrt{\frac{1+\frac{\sqrt{2}}{2}}{2}}$

7. Combine the fractions:

$\frac{1}{2}\sqrt{\frac{2+\sqrt{2}}{4}}$

8. Take the square root:

$\frac{1}{2}\cdot\frac{\sqrt{2}+1}{2}$

9. Multiply the fractions:

$\frac{\sqrt{2}+1}{4}$

So, $\frac{1}{2}\sqrt{\frac{1}{2}+\frac{1}{2}\sqrt{\frac{1}{2}}}$ simplifies to $\frac{\sqrt{2}+1}{4}$.

Question 18

Use your calculator to find the value of $\frac{(\cos 30^{\circ})^2 - (\sin 30^{\circ})^2}{2(\sin 120^{\circ})(\cos 120^{\circ})}$. [2]

1. Use trigonometric identities:
- $\cos 30^{\circ} = \frac{\sqrt{3}}{2}$
- $\sin 30^{\circ} = \frac{1}{2}$
- $\sin 120^{\circ} = \frac{\sqrt{3}}{2}$
- $\cos 120^{\circ} = -\frac{1}{2}$

Substitute these values into the expression:

$\frac{\left(\frac{\sqrt{3}}{2}\right)^2 - \left(\frac{1}{2}\right)^2}{2 \cdot \frac{\sqrt{3}}{2} \cdot \left(-\frac{1}{2}\right)}$

2. Simplify the numerator:

$\frac{\frac{3}{4} - \frac{1}{4}}{-\sqrt{3}}$

3. Combine like terms in the numerator:

$\frac{\frac{2}{4}}{-\sqrt{3}}$

Simplify the fraction:

$\frac{1}{-2\sqrt{3}}$

4. Multiply numerator and denominator by $\sqrt{3}$ to rationalize the denominator:

$\frac{\sqrt{3}}{-6}$

5. Simplify the fraction: [2]

$-\frac{\sqrt{3}}{6}$

So, the expression $\frac{(\cos 30^{\circ})^2 - (\sin 30^{\circ})^2}{2 \sin 120^{\circ} \cos 120^{\circ}}$ simplifies to $-\frac{\sqrt{3}}{6}$.

Question 19

6 $\sin x^{\circ} = 0.86603$ and $0 \leqslant x \leqslant 180$. Find the two values of x.

Given that $\sin x^{\circ} = 0.86603$ and $0 \leqslant x \leqslant 180$, we can find the values of x by using the inverse sine function (arcsin).

1. Find the principal value:

$x_1 = \arcsin(0.86603)$

You can use a calculator to find the principal value of x. This yields $x_1 \approx 60^{\circ}$.

2. Find the second value within the specified range:

Since sin is positive in both the first and second quadrants, there is another solution in the second quadrant.

$x_2 = 180^{\circ} - x_1$

$x_2 = 180^{\circ} - 60^{\circ}$

$x_2 = 120^{\circ}$

So, the two values of x are 60° and 120° within the given range $0 \leqslant x \leqslant 180.0$

Question 20

Use a calculator to find the value of $\sqrt{(5.4(5.4-4.8)(5.4-3.4)(5.4-2.6))}$.

(a) Write down all the figures in your calculator display. [1]

1. Evaluate the expressions inside the parentheses:
$5.4-4.8=0.6$
$5.4-3.4=2.0$
$5.4-2.6=2.8$
2. Multiply these values:
$5.4\times0.6\times2.0\times2.8$
3. Calculate the product:
$5.4\times0.6\times2.0\times2.8\approx9.504$
4. Take the square root:
$\sqrt{9.504}\approx3.08$ [1]
So, $\sqrt{(5.4(5.4-4.8)(5.4-3.4)(5.4-2.6))}$ is approximately equal to 3.08 .

(b) Give your answer correct to 1 decimal place.

To one decimal place, the answer for $\sqrt{(5.4(5.4-4.8)(5.4-3.4)(5.4-2.6))}$ is approximately 3.1.

Question 21

(a) Use your calculator to work out $\dfrac{1-(\tan 40^{\circ})^2}{2(\tan 40^{\circ})}$. [1]

1. Apply the trigonometric identity:
$1-(\tan 40^{\circ})^2=\sec^2 40^{\circ}$
2. Substitute back into the original expression:
$\frac{\sec^2 40^{\circ}}{2\tan 40^{\circ}}$
3. Write $\sec^2$ in terms of tan:
$\frac{1}{\cos^2 40^{\circ}}$
4. Use the identity $\cos^2\theta+\sin^2\theta=1$:
$\frac{1}{1-\sin^2 40^{\circ}}$
5. Replace $\sin^2 40^{\circ}$ with $\cos^2 50^{\circ}$ (using complementary angles):
$\frac{1}{\cos^2 50^{\circ}}$
6. Simplify the expression:
$\frac{1}{\cos^2 50^{\circ}}=\sec^2 50^{\circ}$

So, the simplified form of $\frac{1-(\tan 40^{\circ})^2}{2\tan 40^{\circ}}$ is $\sec^2 50^{\circ}$.

(b) Write your answer to **part (a)** in standard form. [1]

So, in standard form, the expression $\sec^2 50^{\circ}$ is equivalent to $\dfrac{2}{1+\cos 80^{\circ}}$.

Question 22

Use your calculator to work out

(a) $\sqrt{(7+6\times 243^{0.2})}$,

1. Evaluate the power of 243 :
$243^{0.2}=\sqrt[5]{243}=3$
2. Substitute this value back into the expression: [1]
$\sqrt{7+6\times 3}$
3. Perform the multiplication:
$\sqrt{7+18}$
4. Add within the square root:
$\sqrt{25}$
5. Take the square root: 5
So, $\sqrt{7+6\times 243^{0.2}}$ simplifies to 5 .

(b) $2-\tan 30^\circ\times\tan 60^\circ$.

1. Substitute $\tan 60^\circ$ in terms of $\tan 30^\circ$: [1]
$2-\tan 30^\circ\times\sqrt{3}\tan 30^\circ$
2. Substitute the values of $\tan 30^\circ$ and $\tan 60^\circ$:
$2-\left(\frac{1}{\sqrt{3}}\right)\times\sqrt{3}\times\frac{1}{\sqrt{3}}$
3. Simplify:
$2-\frac{\sqrt{3}}{\sqrt{3}}$
4. Combine terms:
$2-1$
5. Simplify further:

Therefore, $2-\tan 30^\circ\times\tan 60^\circ$ simplifies to 1 .

Question 23

Work out

$$\frac{2\tan 30^\circ}{1-(\tan 30^\circ)^2}.$$ [2]

1. Evaluate $\tan 30^\circ$;
$\tan 30^\circ=\frac{1}{\sqrt{3}}$
2. Substitute into the expression:
$\frac{2\cdot\frac{1}{\sqrt{3}}}{1-\left(\frac{1}{\sqrt{3}}\right)^2}$
3. Simplify the expression:
$\frac{\frac{2}{\sqrt{3}}}{1-\frac{1}{3}}$
4. Combine fractions in the numerator:
$\frac{\frac{2}{\sqrt{3}}}{\frac{2}{3}}$
5. Multiply by the reciprocal of the denominator:
$\frac{2}{\sqrt{3}}\times\frac{3}{2}$
6. Simplify:
$\frac{\sqrt{3}}{1}$
So, $\frac{2\tan 30^\circ}{1-(\tan 30^\circ)^2}$ simplifies to $\sqrt{3}$.

Question 24

Calculate the value of 2 $(\sin 15°)(\cos 15°)$. [1]

To simplify the expression $2\sin 15° \cos 15°$, you can use the double-angle identity for sine:

$\sin 2\theta = 2\sin\theta\cos\theta$

In this case, $\theta = 15°$, so:

$\sin 30° = 2\sin 15° \cos 15°$

Now, find the values of $\sin 30°$, $\sin 15°$, and $\cos 15°$:

1. Evaluate $\sin 30°$:

$\sin 30° = \frac{1}{2}$

2. Substitute into the expression:

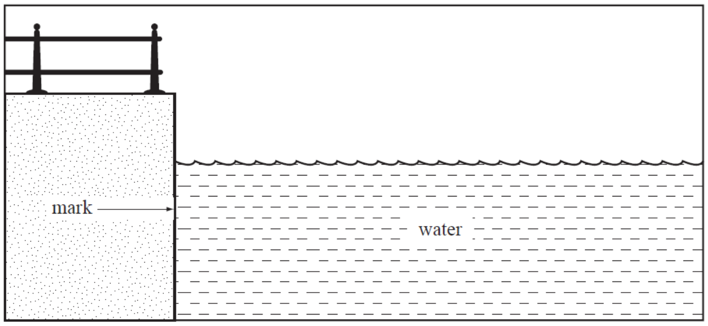
$\frac{1}{2} = 2\sin 15° \cos 15°$

3. Divide by 2:

$\sin 15° \cos 15° = \frac{1}{4}$

So, $2\sin 15° \cos 15°$ simplifies to $\frac{1}{4}$.

Question 25



The height, h metres, of the water, above a mark on a harbour wall, changes with the tide. It is given by the equation

$$h = 3\sin(30t)^\circ$$

where t is the time in hours after midday.

(a) Calculate the value of h at midday.

The height, h metres, of the water, above a mark on a harbour wall, changes with the tide. It is given by the equation
$h = 3\sin(30t)^\circ$
where t is the time in hours after midday.
(a) Calculate the value of h at midday.

[2]

(b) Calculate the value of h at 19 00. [1]

To calculate the value of h at 19:00 (7:00 PM), substitute $t = 7$ into the given equation:

$h = 3\sin(30 \times 7)^\circ$

Now, calculate the expression:

$h = 3\sin(210^\circ)$

The sine function has a period of 360°, so $\sin(210^\circ) = \sin(210^\circ - 180^\circ)$. This is equivalent to $\sin(30^\circ)$.

Now, calculate:

$h = 3 \times \sin(30^\circ)$

Since $\sin(30^\circ) = \frac{1}{2}$, substitute this value:

$h = 3 \times \frac{1}{2}$

$h = \frac{3}{2}$

Therefore, the height h at $19:00$ is $\frac{3}{2}$ meters.

(c) Explain the meaning of the negative sign in your answer. [1]

The negative sign in the answer indicates that the water level is below the reference mark on the harbor wall. In the context of the given equation $h = 3\sin(30t)^\circ$, the height h represents the displacement of the water level above or below the reference mark, and a negative value implies that the water level is below the mark.

In trigonometry, the sine function oscillates between -1 and 1. When $\sin(30^\circ)$ is calculated, it results in a positive value of $\frac{1}{2}$. However, since we have a coefficient of 3 in the equation, the overall value of h becomes $\frac{3}{2}$, which is positive and indicates a displacement above the reference mark.

Therefore, in the specific case of $h = 3\sin(30t)^\circ$, a positive value of h represents an above-average water level, and a negative value represents a below-average water level with respect to the reference mark.

Question 26

Calculate $(3+3\sqrt{3})^3$ giving your answer correct to 1 decimal place. [2]

To calculate $(3+3\sqrt{3})^3$, let's perform the multiplication:
$(3+3\sqrt{3})^3 = (3+3\sqrt{3})(3+3\sqrt{3})(3+3\sqrt{3})$
Use the distributive property and FOIL method to expand the expression. The key is to multiply like terms:
$(3+3\sqrt{3})(3+3\sqrt{3}) = 9+9\sqrt{3}+9\sqrt{3}+27$
Combine like terms:
$36+18\sqrt{3}$
Now multiply this result by $3+3\sqrt{3}$:
$(36+18\sqrt{3})(3+3\sqrt{3})$
Again, use the distributive property and combine like terms:
$108+108\sqrt{3}+54\sqrt{3}+54\times 3$
Combine like terms:
$162+162\sqrt{3}$
So, $(3+3\sqrt{3})^3$ is approximately equal to $162+162\sqrt{3}$ when rounded to one decimal place.

Question 27

alculator to find the value of $\frac{6\sin 50^\circ}{\sin 25^\circ}$. [1]

$\sin 2\theta = 2\sin\theta\cos\theta$
In this case, $\theta = 25^\circ$, so:
$\sin 50^\circ = 2\sin 25^\circ \cos 25^\circ$
Now, substitute this expression back into the original one:
$\frac{6\times 2\sin 25^\circ \cos 25^\circ}{\sin 25^\circ}$
Next, cancel the common factor of $\sin 25^\circ$:
$\frac{12\cos 25^\circ}{1}$
Therefore, $\frac{6\sin 50^\circ}{\sin 25^\circ}$ simplifies to $12\cos 25^\circ$.

Question 28

1 Work out $\frac{2+12}{4+3\times 8}$. [1]

1. Perform the operations inside the parentheses:
$\frac{14}{4+24}$
2. Add the values inside the parentheses:
$\frac{14}{28}$
3. Simplify the fraction:
$\frac{1}{2}$
So, $\frac{2+12}{4+3\times 8}$ simplifies to $\frac{1}{2}$.

Question 29

$V = 4p^2$

Find V when $p = 3$. [1]

To find V when $p = 3$ in the equation $V = 4p^2$, substitute $p = 3$ into the equation:
$V = 4(3)^2$
Now, perform the calculations:
$V = 4 \times 9$
$V = 36$
Therefore, when $p = 3$, V is equal to 36 .

Question 30

Calculate $(2.1 - 0.078)^{17}$, giving your answer correct to 4 significant figures. [2]

$(2.1 - 0.078)^{17}$
1. Subtract:
2.022
2. Raise to the power of 17:
2.022^{17}
3. Calculate:
≈ 47.8875
Rounded to four significant figures, the result is 47.89 . Therefore, $(2.1 - 0.078)^{17}$ is approximately equal to 47.89 when rounded to four significant figures.

Question 31

Calculate.

$$\frac{3.07 + 2^4}{5.03 - 1.79}$$ [1]

1. Calculate the values in the numerator:
$3.07 + 2^4 = 3.07 + 16 = 19.07$
2. Calculate the value in the denominator:
$5.03 - 1.79 = 3.24$
3. Form the fraction:
$\frac{19.07}{3.24}$
4. Perform the division:
≈ 5.883
Therefore, $\frac{3.07+2^4}{5.03-1.79}$ simplifies to approximately 5.883 .

Question 32

Use your calculator to work out $\sqrt{10 + 0.6 \times (8.3^2 + 5)}$. [1]

1. Evaluate the expression inside the parentheses:
$8.3^2 + 5 = 69.49 + 5 = 74.49$
2. Multiply by 0.6 :
$0.6 \times 74.49 = 44.694$
3. Add to 10:
$10 + 44.694 = 54.694$
4. Take the square root:
$\sqrt{54.694} \approx 7.397$

Therefore, $\sqrt{10 + 0.6 \times (8.3^2 + 5)}$ simplifies to approximately 7.397 .

Question 33

1 Use your calculator to find the value of 1.35^7.

Give your answer correct to 5 significant figures. [2]

To find the value of 1.35^7, calculate:
1.35^7
This yields approximately 5.6139 when rounded to 5 significant figures.
Therefore, 1.35^7 is approximately 5.6139 when rounded to 5 significant figures. [1]

Question 34

2 Calculate $\dfrac{8.24 + 2.56}{1.26 - 0.72}$.

1. Calculate the values in the numerator:
$8.24 + 2.56 = 10.8$
2. Calculate the value in the denominator:
$1.26 - 0.72 = 0.54$
3. Form the fraction:
$\frac{10.8}{0.54}$
4. Perform the division:
20

Therefore, $\frac{8.24+2.56}{1.26-0.72}$ simplifies to 20 .

Question 35

Use a calculator to work out the following.

(a) $3(-4 \times 6^2 - 5)$ [1]

1. Calculate the value inside the parentheses:
$-4 \times 6^2 - 5 = -4 \times 36 - 5 = -144 - 5 = -149$
2. Multiply by 3 :
$3 \times (-149) = -447$
Therefore, $3\left(-4 \times 6^2 - 5\right)$ simplifies to -447 .

(b) $\sqrt{3} \times \tan 30° + \sqrt{2} \times \sin 45°$ [1]

1. $\tan 30°$: The tangent of 30 degrees is $\frac{\sqrt{3}}{3}$.
2. $\sin 45°$: The sine of 45 degrees is $\frac{\sqrt{2}}{2}$.
Now, substitute these values into the expression:
$\sqrt{3} \times \frac{\sqrt{3}}{3} + \sqrt{2} \times \frac{\sqrt{2}}{2}$
Simplify each term:
$\frac{3\sqrt{3}}{3} + \frac{2\sqrt{2}}{2}$
Cancel out common factors:
$\sqrt{3} + \sqrt{2}$
So, $\sqrt{3} \times \tan 30° + \sqrt{2} \times \sin 45°$ simplifies to $\sqrt{3} + \sqrt{2}$.

Question 36

(a) Use your calculator to work out $\sqrt{65} - 1.7^2$. Write down all the numbers displayed on your calculator.

1. 1.7^2 means 1.7×1.7, which is 2.89 .
2. Now substitute this value into the expression:
$\sqrt{65} - 2.89$
The square root of 65 is an irrational number, but we can approximate it:
$\sqrt{65} \approx 8.06$
Now substitute this into the expression:
$8.06 - 2.89$
Now, subtract:
5.17
So, $\sqrt{65} - 1.7^2$ simplifies to 5.17 .

(b) Write your answer to **part (a)** correct to 2 significant figures. [1]

1. $\sqrt{65} \approx 8.1$ (rounded to two significant figures).
2. 1.7^2 is 2.89 (rounded to two significant figures).
Now, subtract:
$8.1 - 2.89$
≈ 5.21
So, with the correct number of significant figures, $\sqrt{65} - 1.7^2 \approx 5.21$.

Question 37

Use your calculator to find the value of $\frac{8.1^2 + 6.2^2 - 4.3^2}{2 \times 8.1 \times 6.2}$. [2]

1. 8.1^2 means 8.1×8.1, which is 65.61 .
2. 6.2^2 means 6.2×6.2, which is 38.44 .
3. 4.3^2 means 4.3×4.3, which is 18.49 .
4. $2 \times 8.1 \times 6.2$ is 100.44 .

Now substitute these values into the expression:

$\frac{65.61+38.44-18.49}{100.44}$

Combine the terms in the numerator:

$\frac{85.56}{100.44}$

Now, perform the division:

≈ 0.8503

So, $\frac{8.1^2+6.2^2-4.3^2}{2\times8.1\times6.2} \approx 0.8503$.

Question 38

Work out $11.3139 - 2.28 \times \sqrt[3]{9^2}$.

Give your answer correct to one decimal place. [2]

1. $\sqrt[3]{9^2}$: 9^2 is 81 , and the cube root of 81 is 4.3267487109222245 (rounded to the required precision).
2. $2.28 \times \sqrt[3]{9^2}$: Multiply 2.28 by the cube root of 81 .

$2.28 \times 4.3267487109222245 \approx 9.8638$ (rounded to one decimal place).

1. $11.3139 - 9.8638$: Subtract the result from step 2 from 11.3139 .

$11.3139 - 9.8638 \approx 1.4501$ (rounded to one decimal place).

So, $11.3139 - 2.28 \times \sqrt[3]{9^2} \approx 1.5$ (correct to one decimal place).

Question 39

Find the value of $\dfrac{7.2}{11.8 - 10.95}$.

Give your answer correct to 4 significant figures. [2]

1. Evaluate the denominator: $11.8 - 10.95 = 0.85$.
2. Substitute this result back into the expression:

$\frac{7.2}{0.85}$

1. Perform the division: $\frac{7.2}{0.85} \approx 8.4706$.

So, the value of $\frac{7.2}{11.8-10.95}$ correct to 4 significant figures is 8.471 .

Question 40

(a) Calculate $\sqrt[3]{7^{1.5} + 22^{0.9}}$ and write down your full calculator display. [1]

1. $7^{1.5}$: The square root of 7 is approximately 2.65 , and 2.65^2 is 7 . Therefore, $7^{1.5}$ is$2.65 \times \sqrt{7}$.
2. $22^{0.9}$: Raise 22 to the power of 0.9 .

Now, substitute these values back into the expression:

$\sqrt[3]{2.65 \times \sqrt{7} + 22^{0.9}}$

Perform the calculations:

$\sqrt[3]{2.65 \times \sqrt{7} + 22^{0.9}} \approx \sqrt[3]{2.65 \times 2.65 + 22^{0.9}}$

$\sqrt[3]{2.65^2 + 22^{0.9}} \approx \sqrt[3]{7 + 22^{0.9}}$

The exact numerical value will depend on the specific values used for $\sqrt{7}$ and$22^{0.9}$, but you can use a calculator to find the numerical approximation:

$\sqrt[3]{7 + 22^{0.9}} \approx \sqrt[3]{7 + \text{ numerical value}}$

Please use a calculator for the specific numerical approximation. [1]

(b) Write your answer to **part (a)** correct to 4 significant figures.

1. $7^{1.5}$ means $7 \times \sqrt{7}$, which is approximately 21.056 .
2. $22^{0.9}$ means $22 \times \sqrt[10]{22}$, which is approximately 22×2.32199, resulting in 50.88378 .
3. $7^{1.5} + 22^{0.9}$ is $21.056 + 50.88378 \approx 71.93978$.
4. Now, take the cube root of the result:

$\sqrt[3]{71.93978} \approx 4.2291$

So, $\sqrt[3]{7^{1.5} + 22^{0.9}}$ correct to 4 significant figures is 4.229 .

Question 41

Use your calculator to find $\sqrt{\dfrac{45 \times 5.75}{3.1 + 1.5}}$. [2]

1. Evaluate the numerator: $45 \times 5.75 = 258.75$.
2. Evaluate the denominator: $3.1 + 1.5 = 4.6$.
3. Divide the numerator by the denominator: $\frac{258.75}{4.6} \approx 56.25$.
4. Take the square root of the result: $\sqrt{56.25} \approx 7.5$.

So, $\sqrt{\frac{45 \times 5.75}{3.1+1.5}}$ simplifies to 7.5 .

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Question 42

Use your calculator to find the value of

(a) $3^0 \times 2.5^2$, [1]

Any number raised to the power of 0 is equal to 1 . Therefore, $3^0 = 1$.

Now, let's multiply 1 by 2.5^2 :

$1 \times 2.5^2 = 1 \times 6.25 = 6.25$

So, $3^0 \times 2.5^2 = 6.25$.

(b) 2.5^{-2}. [1]

To calculate 2.5^{-2}, you take the reciprocal of the square of 2.5. The reciprocal of a number x is $1/x$.

$2.5^{-2} = \frac{1}{2.5^2} = \frac{1}{6.25} = 0.16$

So, $2.5^{-2} = 0.16$.

Question 43

Find the value of $\frac{\sqrt[3]{17.1 - 1.89}}{10.4 + \sqrt{8.36}}$. [2]

1. Evaluate the expression inside the cube root: $17.1 - 1.89 = 15.21$.
2. Take the cube root of the result: $\sqrt[3]{15.21} \approx 2.48$ (rounded to two decimal places).
3. Evaluate the expression inside the square root: $\sqrt{8.36} = 2.89$ (rounded to two decimal places).
4. Add 10.4 to the square root result: $10.4 + 2.89 = 13.29$ (rounded to two decimal places).
5. Finally, divide the cube root result by the sum: $\frac{2.48}{13.29} \approx 0.186$ (rounded to three decimal places).

So, the value of $\frac{\sqrt[3]{17.1-1.89}}{10.4+\sqrt{8.36}}$ is approximately 0.186 .