

## 2020 Year 10/10A Topic Tests Information Sheet

**2020 Year 10 Topic Tests** is a set of short answer questions and their solutions.

The topics covered are:

### Year 10 Topics

- Patterns and Algebra (7 questions)
- Linear and non-linear relationships (6 questions)
- Measurement and Geometry (5 questions)
- Trigonometry (4 questions)
- Probability (4 questions)
- Statistics (5 questions)

### 10A Topics

- Number and Algebra (4 questions)
- Non-linear relationships (4 questions)
- Trigonometry & Measurement and Geometry (3 questions)
- Statistics (2 questions)

**2020 Year 10 Topic Tests** also includes a **mid-year test** that consists of:

- 15 multiple choice questions (+5 extra 10A questions)
- 5 short answer questions (+ 2 extra 10A questions)
- 2 extended response questions (+1 extra 10A question)

Please also note the following information.

### Distribution

We will email zipped copies to you

### File format

MS Word docx format (compatible with word 2007/2010/2013/2016)

### Sample

We have attached sample questions below

### Release date

1st of March 2020

### Price

\$100

**2020 Year 10 Mathematics  
Patterns and Algebra Test**

**Time allowed: 1 hour  
Total marks: 40 marks**

**Question 1 (6 marks)**

**a.** Write 35% as a decimal.

1 mark

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**b.** List all prime factors of 65.

1 mark

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**c.** Evaluate  $\frac{(4-6)^3}{-2^2} + 1$ .

1 mark

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**d.** Solve each of the following equations:

**i.**  $-8 - 2x = 4$

1 mark

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**ii.**  $\frac{3x+6}{2} = x+2$ .

2 marks

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**Question 5** (6 marks)

- a.** Find how many years it will take to earn \$1800 of interest if \$6000 is invested at a simple interest rate of 5% per annum. 1 mark

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- b.** \$15 720 is invested at the rate of 5% per annum, compounding annually. 2 marks  
What will the value of the investment be at the end of the first 3 years?

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- c.** Samuel is 11 years older than his brother. In 7 years time, Samuel will be twice his brother's age. 3 marks  
What are the present ages of Samuel and his brother?

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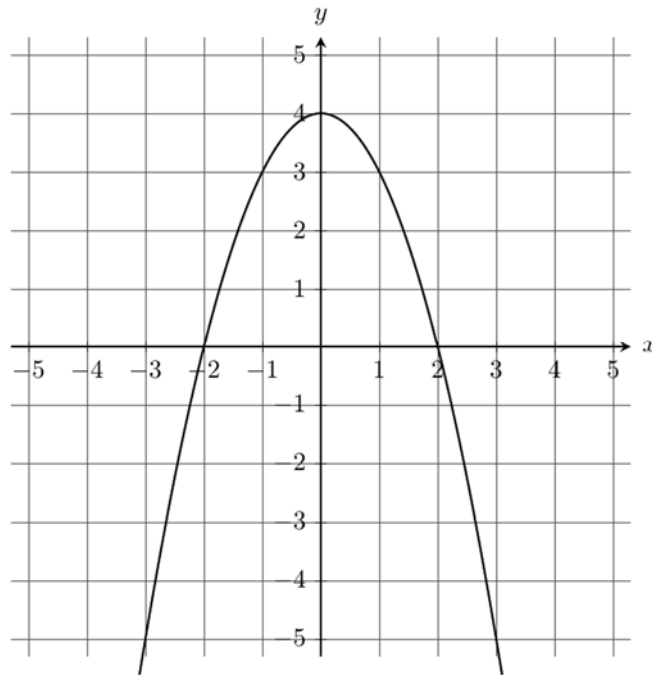
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**Question 2** (5 marks)

a. Find the equation of each of the following graphs.

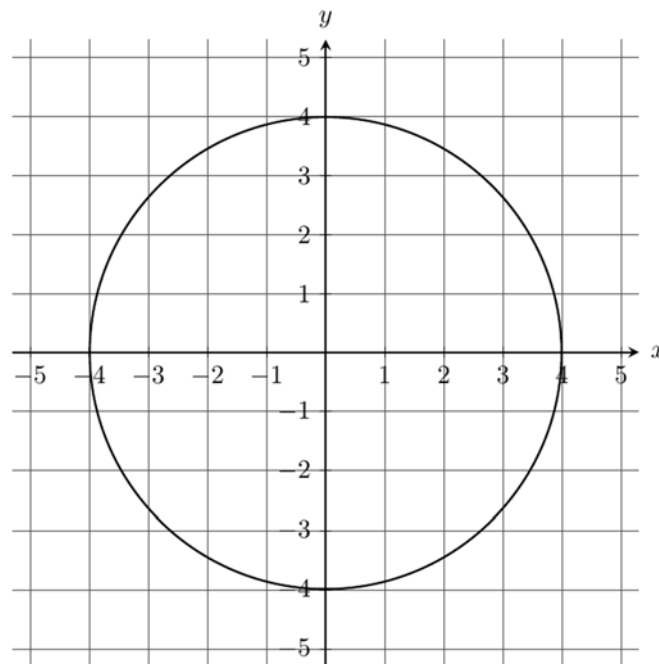
i.

1 mark



ii.

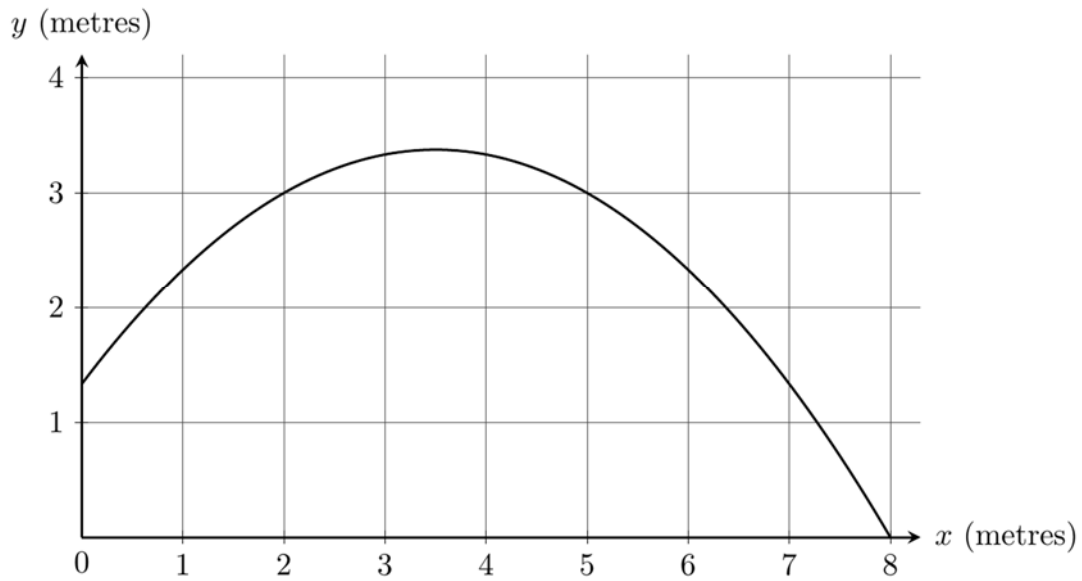
1 mark



**Question 4** (8 marks)

Dylan kicked a ball from flat ground.

The following graph shows the height of the ball above the ground.



$x$  is the horizontal distance that the ball travelled, in metres, away from Dylan.

$y$  is the height of the ball above the ground in metres.

The graph has the equation  $y = \frac{(x+1)(8-x)}{6}$ .

**a.** Find the initial height of the ball.

1 mark

Round your answer to one decimal place.

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**b.** Show that the equation of the graph can be written as  $y = -\frac{x^2 - 7x - 8}{6}$ .

2 marks

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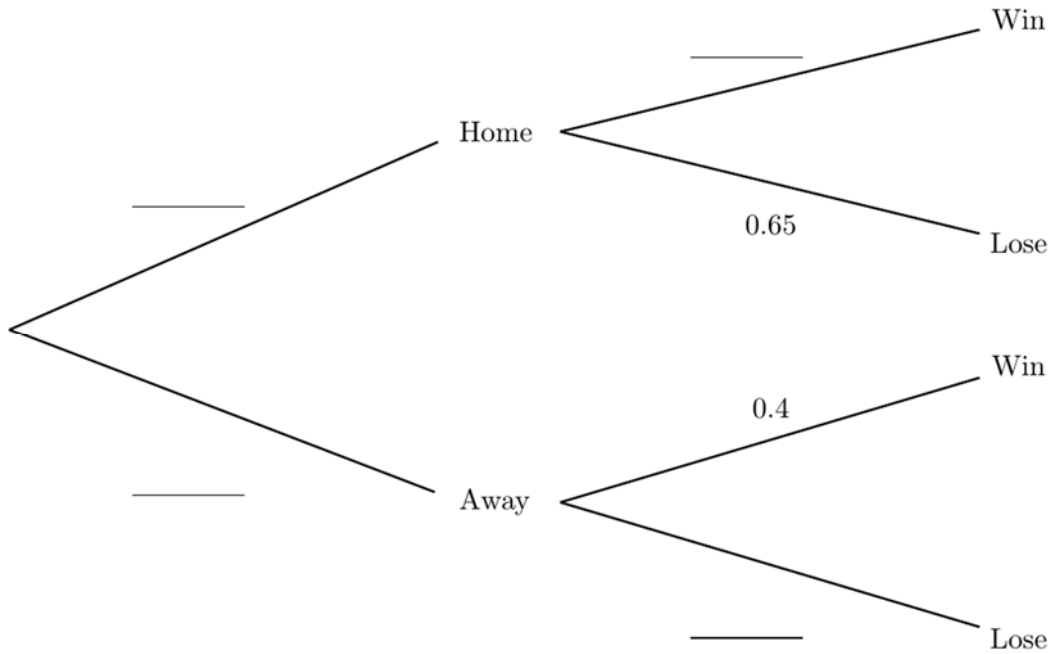
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**Question 3** (10 marks)

Lachlan's soccer team plays 45% of their games away from home.  
When playing away from home, they win 40% of their games.  
On the other hand, they lose 65% of their games when they play at home.

a. Complete the tree diagram below for the outcome of the team's next game.

4 marks



b. Show that the probability that Lachlan's team loses the next game is 0.6275.

2 marks

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c. Find the probability that Lachlan's team wins the next game.

2 marks

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**2020 Year 10A Mathematics  
Number and Algebra Test**

**Time allowed: 1 hour  
Total marks: 35 marks**

**Question 1 (7 marks)**

**a.** For each of the following statements, determine whether it is true or false.

**i.**  $\sqrt{2+5} = \sqrt{2} + \sqrt{5}$  1 mark

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**ii.**  $\log_2(8) = 3$  1 mark

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**iii.**  $\frac{\sqrt{2}}{\sqrt{8}} \in Q$  1 mark

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**iv.**  $\left((2^3)^4\right)^5 = 2^{12}$ . 1 mark

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**b.** What is the degree of the polynomial  $1 - 3x^2 + 5x^4$ ? 1 mark

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**c.** Use set notation to complete each of the following statements.

**i.** 1 mark

$$z \boxed{\phantom{000}} Q$$

**ii.** 1 mark

$$\frac{1}{\sqrt{15}} \boxed{\phantom{000}} Q$$

**Question 3** (7 marks)

**a.** The remainder when  $x^3 + 3x^2 + kx - 1$  is divided by  $x - 1$  is 1.  
Find the value of  $k$ .

2 marks

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**b.** Consider the polynomial  $x^3 - 5x^2 + 3x + 9$ .

**i.** Use the factor theorem to show that  $x + 1$  is a factor.

2 marks

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**ii.** How many distinct roots does the equation  $x^3 - 5x^2 + 3x + 9 = 0$  have?

3 marks

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**Question 3** (12 marks)

**a.** Consider a function with the rule  $f(x) = 2x - 5$ .

**i.** Evaluate  $f(2)$ .

1 mark

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**ii.** Find the value of  $k$  such that  $f(k) = -9$ .

2 marks

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**iii.** Solve  $(f(x))^2 + 2f(x) + 1 = 0$  for  $x$ .

2 marks

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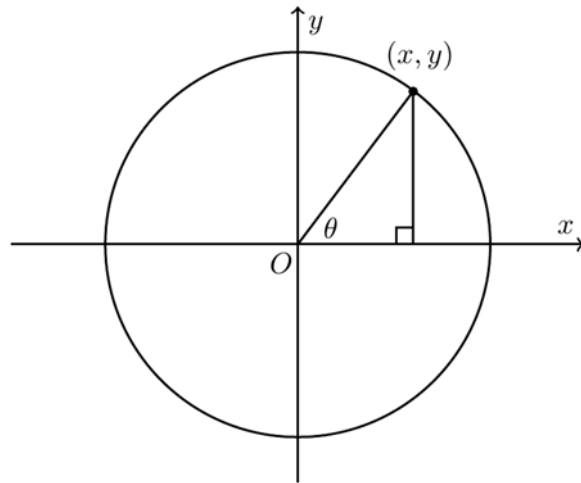
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d. Consider the right-angled triangle inscribed in the unit circle below.



Find each of the following in terms of  $x$  and  $y$ :

i.  $\tan(\theta)$

1 mark

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ii.  $\sin(\theta)$ .

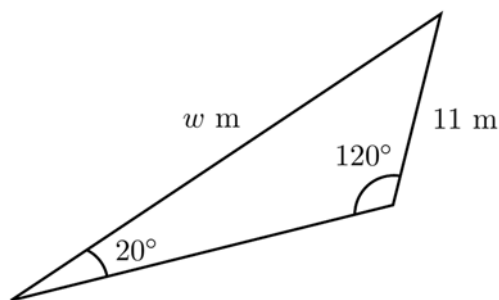
2 marks

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e. Use the sine rule to find the value of  $w$  in the diagram below.  
Round your answer to one decimal place.

2 marks



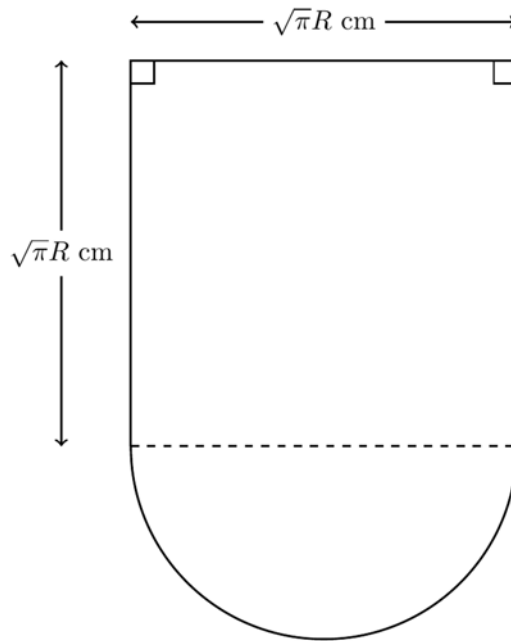
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**Question 4** (7 marks)

The diagram below shows a composite shape which is made up of a semi-circle and a square.



- a.** Show that the ratio between the areas of the square part and the semi-circular part is  $8 : \pi$ . 2 marks

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- b.** Find the area of the composite shape. 2 marks  
Fully factorise your answer.

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# 2020 YEAR 10 MATHEMATICS

## MIDYEAR TEST

Reading time: 15 minutes

Writing time: 2 hours

## QUESTION BOOK

### Structure of book

Section	Number of questions	Number of questions to be answered	Number of marks
A	15	15	15
B	5	5	25
C	1	1	10
			Total 50

**SECTION A**

**Instructions for Section A**

Answer **all** questions.

Choose the response that is **correct** for the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

**Question 1**

$(\sqrt{4} + 14) \div 2^3$  simplifies to

- A. 0.5
- B. 1
- C. 2
- D. 4
- E. 8

**Question 2**

Which one of the following is **not** an integer?

- A.  $-4$
- B. 4.25
- C.  $\sqrt[3]{27}$
- D. 0
- E.  $\frac{3^2}{3}$

**Question 3**

On average, Katie can proofread 4 pages of paperwork per hour.

Which of these is the closest to the time, in minutes, in which she can proofread 100 pages?

- A. 0.42
- B. 25
- C. 400
- D. 1 500
- E. 24 000

**Question 4**

What is the solution to the equation  $1 - 3x = \frac{3x - 7}{2}$ ?

- A.  $x = 1$
- B.  $x = -1$
- C.  $x = 3$
- D.  $x = 4$
- E.  $x = 9$

**SECTION B**

**Instructions for Section B**

Answer **all** questions.  
 In all questions where a numerical answer is required, an **exact** value must be given unless otherwise specified.  
 In questions where more than one mark is available, appropriate working **must** be shown.  
 Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

**Question 1** (5 marks)

a. Write the numbers  $-4$ ,  $\pi$ ,  $2.4$ ,  $-\sqrt{6}$  in order, from the smallest to the largest. 1 mark

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b. What is the closest integer to  $\frac{\sqrt{100}}{(3+2)^2}$  in value? 1 mark

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c. Simplify  $-3x \times (-5x) - 2(3x + 2)$ . 1 mark

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d. For the rule  $2x + y = 10$ , where  $x$  and  $y$  are integers, complete the table below. 1 mark

$x$	1	2	3	4	5
$y$		6			

e. What is the radius of the circle whose area is  $2020 \text{ cm}^2$ ? 1 mark  
 Round your answer to two decimal places.

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# 2020 YEAR 10 MATHEMATICS (10A ONLY)

## MIDYEAR TEST

Reading time: 15 minutes

Writing time: 1 hour

### QUESTION BOOK

#### Structure of book

Section	Number of questions	Number of questions to be answered	Number of marks
A	5	5	5
B	2	2	10
C	1	1	10
			Total 25

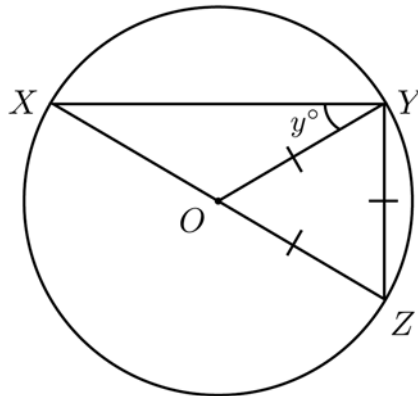
**Question 19**

What are the solutions to the equation  $\sin(x) = 0.89$  for  $0 \leq x \leq 2\pi$ , rounded to one decimal place?

- A. 1.1 only
- B. 2.0 only
- C. 0.5 and 5.2
- D. 1.1 and 2.0
- E. 0.5 only

**Question 20**

In the diagram below,  $O$  is the centre of the circle, and triangle  $XYZ$  is inscribed inside the circle.



The value of  $y$  is

- A. 30
- B. 60
- C. 90
- D. 120
- E. 180



**2020 Year 10 Mathematics  
Trigonometry Test**

**Question 1 (8 marks)**

**a.** 1 mark  
90 or ninety (A1)

**b.** 1 mark  
1 (A1)

**c.** 1 mark  
distance =  $3 \times (2 \times \pi \times 62)$   
 $\approx 1169$  cm (A1)

**d.**  
**i.** hypotenuse (A1) 1 mark

**ii.** 2 marks  
 $AB^2 + BC^2 = 1^2 + \sqrt{3}^2$  (A1)  
 $= 1 + 3$   
 $= 2^2$   
 $= AC^2$  (A1)

**iii.** 2 marks  
 $\sin(30^\circ) = \frac{AB}{AC}$  (A1)  
 $= \frac{1}{2}$  (A1)

**Question 3** (10 marks)

**a.** 2 marks

The scatter plot shows that the correlation is reasonably strong. (A1)  
(as the upward trend in the data is reasonably clear)

The scatter plot shows that the correlation is positive. (A1)  
(as the mathematics marks increase, the physics marks increase)

- Accept the use of wording “association”, instead of correlation.

**b.** 2 marks

The point (45,34) could be an outlier, as it clearly deviates from the rest of the data values and the trend line.

- Location of the potential outlier point. (A1)
- Justification in reference to the scatter plot. (A1)

**c.** 2 marks

The scatter plot shows that the line crosses the vertical axis at 30. (A1)

Taking the points (50,60) and (0,30)

$$\text{slope} = \frac{60-30}{50-0} = 0.6 \quad (\text{A1})$$

Therefore, the equation of the line of best fit is  $\text{physics} = 30 + 0.6 \times \text{mathematics}$ .

**d.** 2 marks

$$\begin{aligned} \text{physics} &= 30 + 0.6 \times 70 \quad (\text{A1}) \\ &= 72 \quad (\text{A1}) \end{aligned}$$

**e.** 2 marks

Any reasonable points such as:

- A sample size of just 25 students may be too small to build a meaningful model.
- The physics exam may not have been that mathematical, therefore not quite capturing the relationship between the students’ mathematics and physics abilities.
- This model may not be applicable for students across all faculties/departments. Some variations are expected, as science students are likely to be stronger in mathematics and physics than fine arts students, for example.
- The trend may not be linear.

- A valid statement (A1) and justification (A1)

**2020 YEAR 10 MIDYEAR TEST (10A ONLY)**

**SOLUTIONS**

**SECTION A**

Question	Answer
16	B
17	E
18	B
19	D
20	A

**Question 16**

$$\begin{aligned} & \log_3(1) + \log_3(9) + \log_3(27) \\ &= 0 + \log_3(3^2) + \log_3(3^3) \\ &= 0 + 2 + 3 \\ &= 5 \end{aligned}$$

Answer is **B**.

**Question 17**

$$\begin{aligned} & x^3 - x^2 - 2x \\ &= x(x^2 - x - 2) \\ &= x(x-2)(x+1) \end{aligned}$$

Therefore, the linear factors are  $x-2$ ,  $x$  and  $x+1$ .

Answer is **E**.

**Question 18**

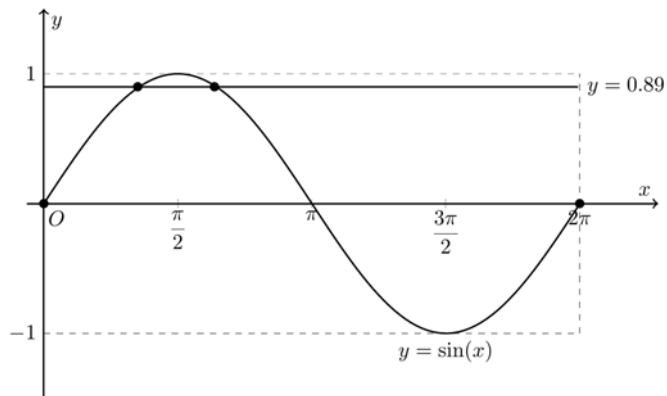
$$\begin{aligned} y &= 2x^2 - 12x + 22 \\ &= 2(x^2 - 6x + 11) \\ &= 2(x^2 - 6x + 9 + 2) \\ &= 2(x-3)^2 + 4 \end{aligned}$$

Therefore, the correct sequence of transformations is: a dilation of factor 2 from the  $x$ -axis, a translation of 3 units to the right, followed by a translation of 4 units upwards.

Answer is **B**.

**Question 19**

There are two solutions as shown by the graph below.



$$x_1 = \sin^{-1}(0.89)$$

$$\approx 1.1$$

By using symmetry of the sine graph, the other solution is

$$x_2 = \pi - \sin^{-1}(0.89)$$

$$\approx 2.0$$

Answer is **D**.

**Question 20**

Since  $OYZ$  is an equilateral triangle, the acute angle  $OYZ$  is  $60^\circ$ .

Moreover, since triangle  $XYZ$  is inscribed in a semicircle, angle  $XYZ$  is  $90^\circ$ .

$$y + 60 = 90$$

$$y = 30$$

Answer is **A**.