

Answers to Grade Gobbler 2

Answer 1

(i) $5\sqrt{2}$ (ii) $12\sqrt{2}$ (iii) $7\sqrt{2}$

[3 marks]

Answer 2

$$\begin{aligned}\int_1^3 \frac{x^3 + 3x^2}{2x} dx &= \int_1^3 \frac{x^3}{2x} + \frac{3x^2}{2x} dx \\ &= \int_1^3 \frac{x^2}{2} + \frac{3x}{2} dx \\ &= \left[\frac{x^3}{6} + \frac{3x^2}{4} \right]_1^3 \\ &= \left(\left[\frac{27}{6} + \frac{27}{4} \right] - \left[\frac{1}{6} + \frac{3}{4} \right] \right) \\ &= 10\frac{1}{3}\end{aligned}$$

You will get NO MARKS in this question if you use the “integration” button on a calculator to get this numerical solution and have no working.

[5 marks]

Answer 3

(a) (i) 10
 (ii) 56
 (iii) 3003

[3 marks]

(b)

$$\begin{array}{ccccccccccc} & & & & & & & & & & 1 \\ & & & & & & & & & & 1 & 1 \\ & & & & & & & & & & 1 & 2 & 1 \\ & & & & & & & & & & 1 & 3 & 3 & 1 \\ & & & & & & & & & & 1 & 4 & 6 & 4 & 1 \\ & & & & & & & & & & 1 & 5 & *10* & 10 & 5 & 1 \\ 1 & & & & & & & & & & 1 & 5 & *10* & 10 & 5 & 1\end{array}$$

[2 marks]

(c)

$$\begin{aligned}P(4 \text{ heads}) &= {}^{10}C_4 \cdot 0.4^4 \cdot 0.6^6 \\ &= 210 \times 0.0256 \times 0.046656 \\ &= 0.251\end{aligned}$$

[4 marks]

Answer 4

(i) $(-1, 3)$

[2 marks]

(ii) 3.16

[1 mark]

(iii) $(x + 1)^2 + (y - 3)^2 = 10$

$(x + 1)^2 + (2x + 4 - 3)^2 = 10$

$(x + 1)^2 + (2x + 1)^2 = 10$

$x^2 + 2x + 1 + 4x^2 + 4x + 1 = 10$

$5x^2 + 6x - 8 = 10$

$(5x - 4)(x + 2) = 0$

Either $x = \frac{4}{5}$ or $x = -2$

Points are $\left(\frac{4}{5}, \frac{28}{5}\right), (-2, 0)$

[6 marks]**Answer 5**

(i) 8 metres

[1 mark]

(ii) $\frac{dh}{dt} = 1.5t^2 - 8t + 10$

[2 marks]

(iii) 10 m s^{-1}

(iv) $\frac{d^2h}{dt^2} = 3t - 8$

[1 mark]

(v) 2.67 seconds

[3 marks]**Answer 6**

$$\begin{aligned}
 (x - 1)(x + 1)^3 &= (x - 1)(1 + 3x + 3x^2 + x^3) \\
 &= x + 3x^2 + 3x^3 + x^4 - 1 - 3x - 3x^2 - x^3 \\
 &= x^4 + 2x^3 - 2x - 1
 \end{aligned}$$

This document is a part of a **Mathematics Community Outreach Project** initiated by Shrewsbury School

It may be freely duplicated and distributed, unaltered, for non-profit educational use

In October 2020, Shrewsbury School was voted "**Independent School of the Year 2020**"

© 2021 Number Wonder

Teachers may obtain detailed worked solutions to the exercises by email from mhh@shrewsbury.org.uk