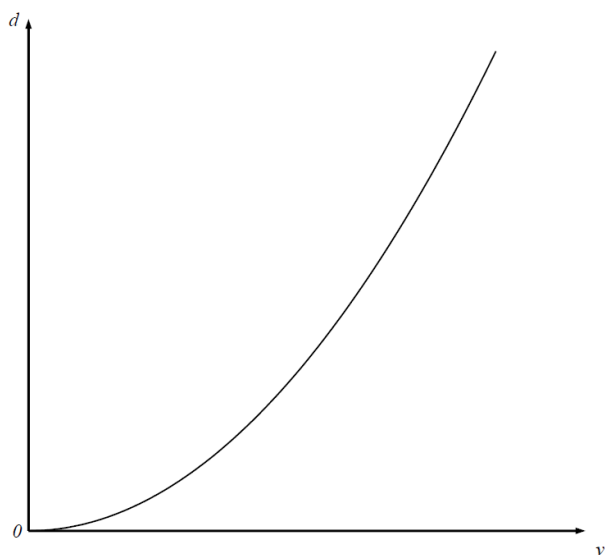


Level 3 Algebra – Direct and Inverse Proportion - Answers

June 2013 - Question 11

Question	Working	Answer	Mark	Notes
11	(a) $d = kv^2$ $6 = k \times 30^2$ $k = \frac{1}{150}$	$d = \frac{1}{150} v^2$	3	M1 for $d \propto v^2$ or $d = kv^2$ M1 for method to establish the value of k , eg by substituting to get $6 = k \times 30^2$ A1 for $d = \frac{1}{150} v^2$ oe
	(b)	sketch	1	B1 for sketch of $d = "k"v^2$
	(c) $\frac{1}{150} \times 60^2$	24	2	M1 for substituting $v = 60$ into $d = "k"v^2$ A1 ft
	(d) $96 = \frac{1}{150} v^2$ $v^2 = 14400$	120	2	M1 for substituting $d = 96$ into $d = "k"v^2$ A1 ft

11(b)



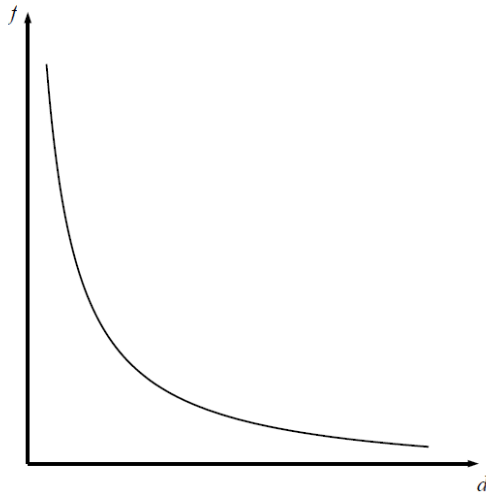
Jan 2014 - Question 17

17	$54 = k \times 3^3$ $k = 2$	$V = 2x^3$	3	M1 for $V \propto x^3$ or $V = kx^3$ M1 for method to establish value of k A1 for $V = 2x^3$
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Jan 2015 - Question 17

17	(a)	$f = \frac{k}{d}$ $64 = \frac{k}{20}$ $k = 1280$	$f = \frac{1280}{d}$	3	M1 for $f \propto \frac{1}{d}$ or $f = \frac{k}{d}$ M1 for method to establish k (= 1280) A1 for $f = \frac{1280}{d}$
	(b)		sketch	1	B1 for correct general shape

17(b)



June 2015 - Question 3

3	(a)		$T = 13v^2$	3	M1 for $T = kv^2$ or T is proportional to v^2 oe M1 for substitution to find k A1 $T = 13v^2$
	(b)		-2 and 2	3	M1 for substitution of $T = 52$ into their 'formula' M1 for correct rearrangement to make v^2 the subject A1 for ± 2

Jan 2016 - Question 19

19	$48 = k \times 2^3$ $k = 6$	$p = 6d^3$	2	M1 $p = kd^3$ oe, may be implied by substitution A1 cao
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June 2016 - Question 6

6	(a)		$T = \frac{1}{2x^3}$	3	M1 for $T = \frac{k}{x^3}$ or $T \propto \frac{1}{x^3}$ oe M1 for substitution to find k A1 oe
	(b)		0.5	2	M1 for substitution of 4 into their formula A1 for 0.5 oe

Jan 2017 - Question 17

Question	Working	Answer	Mark	Notes
17 (a)	$5 = \frac{k}{\sqrt{36}}$	$p = \frac{30}{\sqrt{n}}$	3	M1 $p = \frac{k}{\sqrt{n}}$ oe, may be implied by substitution M1 for substitution to find k A1 cao
(b)		Sketch	1	B1 for sketch


June 2017 - Question 11

Question	Working	Answer	Mark	Notes
11 (a)		$W = \frac{252}{t^2}$	3	M1 for $W \propto \frac{1}{t^2}$ or $W = \frac{k}{t^2}$ M1 (dep M1) for method to establish $k (= 252)$ A1 for $W = \frac{252}{t^2}$
(b)		± 3	2	M1 ft for substituting into formula of form $W = \frac{k}{t^2}$ A1 ± 3

Jan 2018 - Question 11

Question	Working	Answer	Mark	Notes
11 (a)	$10 = 0.25k$	$m = 40h^2$	3	M1 $m \propto h^2$ or $m = kh^2$ oe, may be implied by substitution M1 (dep M1) for substitution to find k A1 cao
(b)	$160 = 40h^2$	± 2	2	M1 for substitution of $m = 160$ in $m = "kh^2"$ (may be implied by one correct value) A1 cao

June 2018 - Question 4

Question	Working	Answer	Mark	Notes
4 (a)	$8 = \frac{k}{5^2}$ $k = 200$	$F = \frac{200}{d^2}$	3	M1 for $F = \frac{k}{d^2}$ or $F \propto \frac{1}{d^2}$ M1 for $8 = \frac{k}{5^2}$ oe A1 cao
(b)		$\frac{1}{2}$	1	B1 ft from $F = \frac{k}{d^2}$ in (a)
(c)		Graph sketched	1	B1 correct sketch

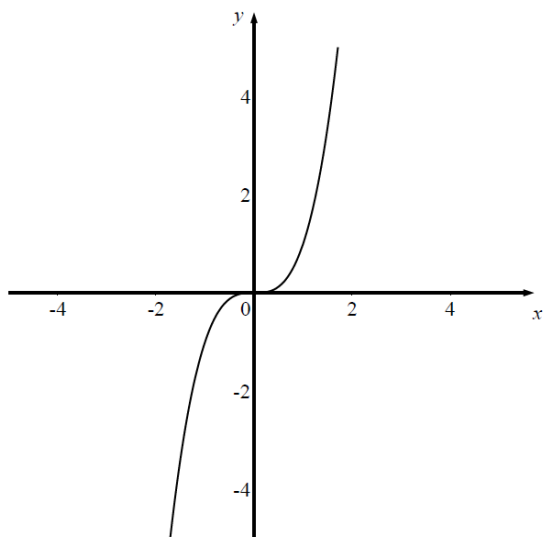
Jan 2019 - Question 11

Question	Working	Answer	Mark	Notes
11 (a)	$2 = \frac{k}{\sqrt{25}}$	$T = \frac{10}{\sqrt{f}}$	3	M1 $T \propto \frac{1}{\sqrt{f}}$ or $T = \frac{k}{\sqrt{f}}$ oe, may be implied by substitution M1 for substitution to find k A1 cao
(b)		$\frac{1}{2}$	2	M1 for substitution of $f = 400$ in $T = \frac{k}{\sqrt{f}}$ A1 for $\frac{1}{2}$ or 0.5

June 2019 - Question 9

9	(a)		$h = 4x^3$	3	M1 $h = kx^3$ oe, or $h \propto x^3$ may be implied by substitution M1 for substitution to find k , eg $108 = k \times 3^3$ A1 cao
	(b)		-2	2	M1 for substituting -32 into equation of the form $h = kx^3$ A1 cao
	(c)		sketch	1	B1 for sketch

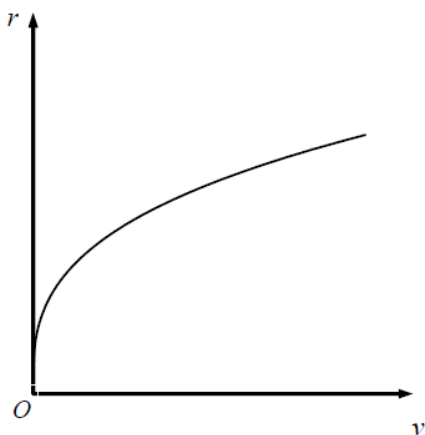
Qu 9c



Jan 2020 - Question 15

15	(a)	$15 = k\sqrt[3]{27}$	$r = 5\sqrt[3]{v}$	3	M1 $r \propto \sqrt[3]{v}$ or $r = k\sqrt[3]{v}$ oe, may be implied by substitution M1 for substitution to find k A1
	(b)		sketch	1	B1 for correct general shape

Question 15(b)



Jan 2021 - Question 10

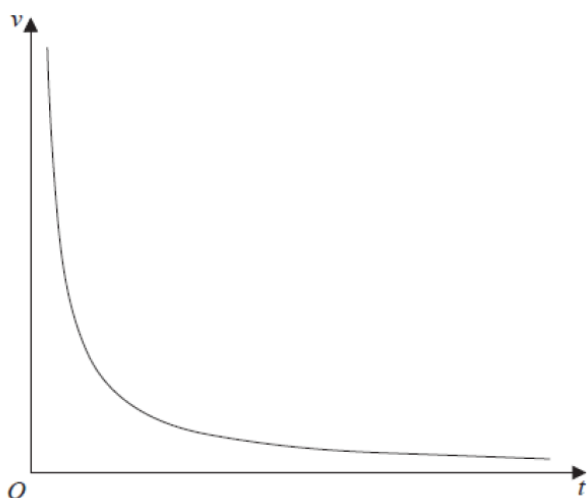
Question	Working	Answer	Mark	Notes
10 (a)		$y = \frac{54}{x^3}$	3	M1 $y = \frac{k}{x^3}$ oe, or $y \propto \frac{1}{x^3}$ may be implied by substitution M1 for substitution to find k A1 oe
(b)		$\frac{1}{6^3}$	2	M1 for substituting $y = 9$ into $y = \frac{k}{x^3}$, eg $9 = \frac{54}{x^3}$ A1 cao

Jan 2022 - Question 9

9 (a)		$f = \frac{5}{a}$	3	M1 $f \propto \frac{1}{a}$ or $f = \frac{k}{a}$ oe, may be implied by substitution M1 for substitution to find k A1
(b)		$u = 2 \pm \sqrt{\frac{3}{w}}$	3	M1 for dealing with the fraction, eg $w(2-u)^2 = 3$ or dealing with the square root, eg $(\pm)\sqrt{w} = (\pm)\sqrt{\frac{3}{(2-u)^2}}$ M1 for $2-u = (\pm)\sqrt{\frac{3}{w}}$ A1 for $u = 2 \pm \sqrt{\frac{3}{w}}$ oe

June 2022 - Question 12

12 (a)		$v = \frac{240}{t}$	3	M1 $v = \frac{k}{t}$ oe, or $v \propto \frac{1}{t}$ may be implied by substitution M1 for substitution in $v = \frac{k}{t}$ to find k , eg $60 = \frac{k}{4}$ A1 for $v = \frac{240}{t}$
(b)		3	2	M1 for substituting $v = 80 < \text{ft}$ $v = \frac{k}{t}$, eg $80 = \frac{240}{t}$ A1 ft use of $v = \frac{k}{t}$
(c)		Graph sketched	1	B1



Jan 2023 - Question 6

Question	Working	Answer	Mark	Notes
6 (a)		$y = 4x$	2	M1 $y = kx$ oe, or $y \propto x$, may be implied by substitution A1 cao
(b)		$\sqrt{24}$	4	M1 $p^2 = \frac{K}{r^3}$ oe, or $p^2 \propto \frac{1}{r^3}$, may be implied by substitution M1 for substitution in $p^2 = \frac{K}{r^3}$ to find K eg $3^2 = \frac{K}{2^3}$ or $K = 72$ M1 for substitution of $3^{\frac{1}{3}}$ into $p^2 = \frac{72}{r^3}$ oe eg $p^2 = \frac{72}{\left(3^{\frac{1}{3}}\right)^3} (= 24)$ A1 cao

June 2023 - Question 11

Question	Working	Answer	Mark	Notes
11 (a)		$p = \frac{1}{2} \sqrt{n}$	3	M1 for $p \propto \sqrt{n}$ or $p = k\sqrt{n}$ oe, may be implied by substitution M1 for substitution to find k , eg $5 = k\sqrt{100}$ A1 for $p = \frac{1}{2} \sqrt{n}$
(b)		1600	2	M1 for substitution in equation of form $p = k\sqrt{n}$, eg $20 = \frac{1}{2} \sqrt{n}$ A1 cao

Jan 2024 - Question 12

12 (a)		$t = \frac{300}{v}$	3	M1 $t = \frac{k}{v}$ oe, or $t \propto \frac{1}{v}$ may be implied by substitution M1 for substitution to find k A1 oe
(b)		50	2	M1 for substituting $t = 6$ into $t = \frac{k}{v}$ A1 ft use of $t = \frac{k}{v}$
(c)		Graph sketched	1	B1

Question 12

